2.8 International Collaborations

As a result of research accomplishments by the NIOSH Mining Program, the worldwide mining engineering and scientific community has recognized our unique expertise, capabilities, and facilities. The following table summarizes collaborative activities between NIOSH mining researchers and various organizations around the world since 1996.

47 collaborations

Country	Activity	Start Year	End Year	Strategic Goal
Australia; Canada; South Africa	The Global Mining Research Alliance (GMRA) is a collaboration that aims to become the supplier of choice for mining research solutions and knowledge in the international mining and resources industry. The partners forming the alliance are the Canada Centre for Mineral and Energy Technology, Mining and Mineral Sciences Laboratories (CANMET-MMSL); the Council for Scientific and Industrial Research (CSIR) Miningtek (Republic of South Africa); the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Exploration and Mining (Australia); and the National Institute for Occupational Safety and Health (NIOSH) (United States). GMRA undertakes cooperative research designed to benefit the industry in technologies associated with mineral exploration and resource management, extractive technologies, ground control, occupational health and safety, equipment automation, mineral processing, and the environment. The main objectives of GMRA include (1) improving the work environment for mine workers by researching and developing technologies that lead to sustainable industry practice, (2) sharing expertise and facilities among the GMRA partners, (3) providing economic leverage to funding by reducing duplication and coordinating research efforts in order to increase the probability of success, and (4) providing improved opportunities for career development through staff exchanges between GMRA partners.	2005	Present	All
Canada	NIOSH PRL diesel researchers have been collaborating with the Canadian Diesel Emission Evaluation Program (DEEP) by providing technical expertise on underground sampling and have shared in the findings.	1999	Present	Respiratory diseases
South Africa	NIOSH has been collaborating with the Council for Scientific and Industrial Research (CSIR) to conduct research on reducing excessive exposure to noise for rock drill operators by developing low-cost retrofit engineering noise controls.	2000	Present	Hearing loss
Chile	Two senior researchers are serving on a committee to investigate silica dust control in Chile.	2005	Present	Respiratory diseases

Country	Activity	Start Year	End Year	Strategic Goal
Australia; Canada; Denmark; Indonesia; Iran; Ireland; Israel; Mexico; New Zealand; South Africa; United Kingdom	The NIOSH-developed Hearing Loss Simulator has been used in 11 countries around the world.	2005	Present	Hearing loss
All	A NIOSH researcher is a member of the International Organization for Standardization´s (ISO) Earth-Moving Machinery Work Group, which is developing standards for hazard detection and warning systems for blind areas near mining machinery. The researcher also acts as a subject matter expert for the development of ISO standards related to machine safety. ISO is a global network of the national standards bodies of more than 140 countries located in all regions of the world.	2002	Present	Traumatic injuries
Czech Republic	A NIOSH researcher is on the review board of a Czech grant agency that reviews submittals for projects in rock mechanics instrumentation and numerical modeling of underground mines. This work started in 2002; three proposals have been reviewed to date.	2002	Present	Ground control
South Africa	NIOSH is scheduled to carry out additional tests to evaluate triggered rock dust barriers for explosion protection for the Safety in Mines Research Advisory Committee (SIMRAC) and CSIR Miningtek.	2006	2006	Mine disasters
India	A senior researcher has been invited to present a workshop in India on silica dust control.	2006	2006	Respiratory diseases
Australia	A senior researcher participated in laboratory and field trials of the NIOSH diesel detective tailpipe sampler under a Memorandum of Understanding with BHP-Billiton/AEHS, Mineral Resources of New South Wales.	2002	2005	Respiratory diseases
Poland	A NIOSH researcher was invited to present a paper at the KOMTECH Sixth International Scientific and Technical Conference in Zakopane, Poland, on "Comparing Estimated Low-Back Loads From Control Interventions for Underground Coal Mine Roof Bolter Operators." The researcher also met with representatives of the KOMAG Mining Mechanization Center in Gliwice, Poland, to discuss common research efforts to eliminate traumatic injuries in the mining workplace. The visit to KOMAG included a tour of its facilities and discussions about research activities at KOMAG and PRL.	2005	2005	Cumulative injuries

Country	Activity	Start Year	End Year	Strategic Goal
Chile	A senior researcher was an invited guest lecturer at two prominent educational institutions in Chile: Technical University Federico Santa María, Valparaiso, and Universidad de Concepción, Concepción. Representatives from both universities had heard his presentation at the IEEE Industry Applications Conference in Hong Kong in October 2005. Both universities have strong undergraduate and graduate engineering programs and believed that the following presentations would greatly benefit students and the Chilean mining industry: "NIOSH Best Practice Recommendations for the Functional Safety of Programmable Electronic Mining Systems," "Emerging Technology Research at the NIOSH Pittsburgh Research Laboratory," and "An Overview of Wireless Sensor Technologies for Mining Applications."	2005	2005	Traumatic injuries
United Kingdom	NIOSH collaborated on a joint project with researchers from Imperial College in London to study postexplosion coal dust samples. The work was funded by the British Coal Utilisation Research Association.	2004	2005	Mine disasters
South Africa	NIOSH participated in a SIMRAC project to evaluate roof bolt support systems used by the South African coal industry.	2005	2005	Ground control
Canada	Researchers from the Canada Centre for Mineral and Energy Technology (CANMET) collaborated with NIOSH scientists to characterize weak rock masses in underground mines. This work resulted in the publication, "Influence of Intermediate Principal Stress on Rock Mass Quality."	2005	2005	Ground control
Australia	NIOSH researchers collaborated with mine personnel of the Xstrata Zinc-George Fisher Mine, Mount Isa, Queensland, on the use of split-set rock bolts to monitor rock movement in underground mines.	2005	2005	Ground control
Australia	NIOSH participated in an ACARP project to develop guidelines for support of ribs in underground coal mines. This resulted in the Analysis and Design of Rib Support (ADRS) software package.	2001	2005	Ground control
Canada	NIOSH, the Ontario Mines and Aggregates Safety and Health Association, Inco, and CANMET shared research findings relative to protecting mine rescue workers in hot environments and developed research protocols to develop and test mine rescue procedures in hot Canadian mines.	2004	2005	Surveillance and training

Country	Activity	Start Year	End Year	Strategic Goal
Canada	NIOSH researchers worked with Neodym Technologies, Inc., Vancouver, British Columbia, to adapt the company´s stationary hydrogen sensor technologies to a platform suitable for use in a safety control system on underground mine mobile equipment. Transferring this temperature-compensating combustible gas system to a mobile platform and integrating it into a programmable controller that manages a vehicle´s hydrogen fuel supply allowed NIOSH´s Zero Emissions Utility Solution (ZEUS) vehicle to be safely operated under the variable environmental conditions found in U.S. underground mines.	2003	2004	Surveillance and training
Venezuela	A NIOSH researcher worked with engineers and safety staff at Hecla Mining´s La Camorra Mine in Venezuela to provide copies of all underground training videos. The collaboration resulted in translation of three videos into Spanish for mine employees.	2002	2004	Surveillance and training
Australia	Researchers from NIOSH and the University of Queensland collaborated on studies of backfill, cavability of rock, cemented rock fill for ground support, and overbreak due to blasting.	2004	2004	Ground control
Canada	Analysts from the Ontario Ministry of Labour collaborated with NIOSH researchers to generate statistics on health and safety in mining, specifically, information related to the analysis of mine disasters.	2004	2004	Ground control
Canada	NIOSH researchers continued collaborative work with Inco of Sudbury, Ontario, pertaining to weak rock, assessments of shotcrete, and the effectiveness of ground support.	2002	2004	Ground control
Canada	Personnel from Placer Dome's Musselwhite Mine in Ontario collaborated with NIOSH researchers to assess weak ground, ground support, and cemented backfill in weak ground. Results of the work were published in the proceedings of the Canadian Institute of Mining, Metallurgy and Petroleum´s (CIM) 2004 annual meeting.	2002	2004	Ground control
Germany	A NIOSH researcher was coauthor with a German colleague of a book chapter on "Eigenschaften Brennbarer Stäube" in Handbuch des Explosionsschutzes, published in German in 2000. The chapter and handbook were later translated into English in 2004 as "Properties of Combustible Dusts" in the Handbook of Explosion Prevention and Protection.	2000	2004	Mine disasters
Australia	NIOSH researchers collaborated with Minova Australia to evaluate an innovative, flexible brattice stopping design against 2- and 5-psi explosion overpressures within NIOSH´s Lake Lynn Experimental Mine. Based on the results of these evaluations, this Flexi-Stop stopping is now being used in some Australian underground coal mines.	2003	2003	Mine disasters
South Africa	NIOSH participated in a SIMRAC/Miningtek project to transfer the Coal Mine Roof Rating (CMRR) to the South African coal industry.	2002	2002	Ground control

Country	Activity	Start Year	End Year	Strategic Goal
Canada	NIOSH participated in the Underground Coal Mine Safety Research Collaboration project entitled "Standardisation of Geological and Geomechanical Assessment at Underground Coal Mines in Canada," which involved transfer of ALPS, Analysis of Retreat Mining Pillar Stability (ARMPS), the Coal Mine Roof Rating (CMRR), and horizontal stress control technologies.	1999	2001	Ground control
Mexico	NIOSH received a request for technical assistance from Mexico´s National Institute of Public Health (Instituto Nacional de Salud Pública (INSP)) to assess mercury exposures at reprocessing plants in Zacatecas. NIOSH and INSP researchers spent a week assessing the potential for occupational exposure to mercury at four plants that reprocess old mine tailings that contain a significant amount of mercury.	2001	2001	Surveillance and training
Switzerland	NIOSH collaborated with SIG Rocktools AG to conduct research to reduce excessive noise exposure to rock drill operators.	2000	2001	Hearing loss
South Africa	A Fulbright scholar from the University of Pretoria, Republic of South Africa, worked with NIOSH scientists for 3 months as a guest researcher to assist in developing a device called a Shox Box. The device incorporates a global positioning system to display the locations and amplitude of mechanical jolts experienced by operators of haulage trucks. To date, 102 Shox Boxes have been produced and used in industry. The device was developed under a Cooperative Research and Development Agreement between NIOSH and Phelps Dodge´s Morenci Mine.	2001	2001	Cumulative injuries
Australia	Under the sponsorship of the New South Wales Department of Mineral Resources, a NIOSH researcher met with mine safety officials and mine equipment manufacturers to discuss obtaining case study material and accident data for programmable electronic mining systems. He was the keynote speaker at the 11th Annual Electrical Engineering Safety Seminar held in Penrith, New South Wales. He conducted a workshop on "NIOSH Best Practice Recommendations for Programmable Electronic Mining Systems," both in Penrith and Brisbane. The workshop helped establish a world leadership position for NIOSH in the area of programmable electronic mining equipment safety. In Brisbane, he was hosted by the University of Queensland Mineral Industry Safety and Health Center and the Queensland Department of Natural Resources and Mining. His presentations were used by the university in its Mining Risk Analysis course work.	2001	2001	Traumatic injuries
United Kingdom	A senior researcher assisted in evaluating a prototype NIOSH dust dosimeter in 10 U.K. coal mines under a Letter of Understanding with the U.K. Health and Safety Executive.	1999	2001	Respiratory diseases

Country	Activity	Start Year	End Year	Strategic Goal
South Africa	NIOSH collaborated with the Council for Scientific and Industrial Research (CSIR) to evaluate barriers used to suppress coal dust explosions. The passive barrier design consisted of a series of strategically placed bags of stone dust that were suspended from the mine roof. Based on the successful conclusion of this joint project, these explosion barriers are now being used to protect miners from underground explosions in the Republic of South Africa. This work was conducted in NIOSH´s Lake Lynn Experimental Mine and was fully funded by CSIR.	1999	2000	Mine disasters
Poland	NIOSH cosponsored an international seminar on "Seals and Barriers as a Means of Protection Against Fires and Explosions in Mines" (SEALBARR ´99) held in Katowice, Poland. This 2-day U.S.-Poland seminar was held to promote international technology transfer of mine seals and barriers for controlling mine explosions.	1999	1999	Mine disasters
Poland	Two senior researchers cooperated with researchers from KOMAG Mining Mechanization Center in Gliwice, Poland, to evaluate the dust generation potential for various coals collected from mines in the United States and Poland. In addition, a comparison of the dust control technologies used on longwall mining operations in both countries was completed.	1995	1999	Respiratory diseases
Ecuador	As a result of a request for technical assistance from the Minister of Health for Ecuador, a study was conducted to assess occupational exposure to mercury in the gold mining region of Bella Rica, Ecuador. NIOSH researchers, in collaboration with researchers from George Washington University and the University of Cuenca, Ecuador, conducted an industrial hygiene study, a medical study, and an evaluation of the region's mining processes. The outcome was a technical report on this site survey, which provided the mining industry in Bella Rica with an evaluation of the extent of mercury exposures in the workplace and suggested interventions for protecting potentially exposed workers.	1999	1999	Surveillance and training
Australia	NIOSH researchers participated in a project of the Australian Coal Association Research Program (ACARP) to calibrate the Analysis of Longwall Pillar Stability (ALPS) method for Australian conditions. This resulted in the Analysis of Longwall Tailgate Serviceability (ALTS) software package.	1995	1998	Ground control
Venezuela	NIOSH researchers, in collaboration with the Center for Toxicological Investigations, University of Carabobo, Venezuela, conducted a comprehensive survey to determine if overexposure to mercury was occurring in El Callao, a gold mining area in Venezuela. The site survey consisted of the collection of personal breathing zone samples, spot urine samples, administration of a questionnaire by an occupational physician, a comprehensive evaluation of the processing techniques currently being used by the mine personnel, and recommendations for reducing exposure to mercury.	1998	1998	Surveillance and training

Country	Activity	Start Year	End Year	Strategic Goal
Panama	Two senior NIOSH researchers analyzed risk factors for low-back pain among line handlers and deck hands at the Panama Canal and made recommendations on job design changes to reduce the risk of back injury.	1998	1998	Cumulative injuries
Viet Nam	NIOSH assisted with the development and presentation of a NIOSH ergonomics workshop for the Vietnamese National Institute of Occupational and Environmental Health (NIOEH).	1998	1998	Cumulative injuries
Australia	NIOSH collaborated on two joint research projects with Australian seal manufacturers to investigate the capability of various ventilation control structures to meet or exceed the requirements of the Queensland Department of Mines and Energy´s "Approved Standard for Ventilation Control Devices." This research was conducted in NIOSH´s Lake Lynn Experimental Mine. The purpose was to evaluate the explosion resistance of various seals and stoppings and an overcast. Based on the successful conclusions to these joint projects, these ventilation structures are now being used to protect miners from underground explosions in Australia and in some U.S. mines. This research was fully funded by Tecrete Industries of New South Wales and Barclay Mowlem Construction of Queensland.	1997	1998	Mine disasters
Poland	NIOSH cosponsored a 5-day symposium with the American Society for Testing and Materials and the National Fire Protection Association (United States) and the Warsaw University of Technology and the Committee for Thermodynamics and Combustion of the Polish Academy of Sciences (Poland). The symposium presentations transferred knowledge on gas, dust, and hybrid explosion hazards and prevention techniques. The symposium was held in Schaumburg, IL, with 100 attendees from 13 countries. The 56 papers from the symposium were published in two proceedings volumes.	1998	1998	Mine disasters
Czech Republic	A NIOSH researcher was the U.S. representative for the U.S.-Czech Science and Technology Joint Fund project "Rock Mass Freezing." A method for mathematically modeling rock bolt reinforcements was developed and is now used in numerical models of underground mines in both countries.	1994	1998	Ground control
Japan	A senior researcher presented an "Overview of U.S. Research on Three Approaches to Ensuring That Coal Miners Work Safely: Management, Workplace Design, and Training" at the request of the Japan Technical Cooperation Center for Coal Resources Development.	1997	1997	Surveillance and training
Mexico	A senior researcher, at the request of the World Health Organization, taught a week-long course to mining health and safety representatives in Mexico on mining health issues and their control. He also visited several underground coal mines and provided guidance on a number of health and safety issues.	1996	1996	Respiratory diseases

Country	Activity	Start Year	End Year	Strategic Goal
Saudi Arabia	A senior researcher, at the request of the State Department, worked in Saudi Arabia for several weeks to advise the Saudis on dust control at aggregate operations, cement plants, and gold mines.	1995	1995	Respiratory diseases